What is claimed is:

1. A field effect transistor comprising:

an insulating vanadium dioxide thin film used as a channel material;

a source electrode and a drain electrode disposed on the insulating vanadium dioxide thin film to be spaced apart from each other by a channel length;

a dielectric layer disposed on the source electrode, the drain electrode, and the insulating vanadium dioxide thin film; and

a gate electrode for applying a predetermined voltage to the dielectric layer.

2. The field effect transistor of claim 1, wherein the vanadium dioxide thin film is disposed on a silicon substrate, a silicon-on-insulator substrate, or a sapphire substrate.

3. The field effect transistor of claim 1, wherein the dielectric layer is selected from the group consisting of $Ba_{1-x}Sr_xTiO_3$ ($0 \leq x \leq 0.6$), $Pb_{1-x}Zr_xTiO_3$ ($0 \leq x \leq 0.5$), Ta_2O_3, Si_3N_4, and SiO_2.

4. The field effect transistor of claim 1, wherein the source electrode, the drain electrode, and the gate electrode are gold/chromium electrodes.

5. A method of manufacturing a field effect transistor, comprising:

forming a vanadium dioxide thin film on a substrate;

forming a source electrode and a drain electrode on the vanadium dioxide thin film to cover portions at both right and left sides of the vanadium dioxide thin film;

forming a dielectric layer on the substrate, the source electrode, the drain electrode, and the vanadium dioxide thin film; and

forming a gate electrode on the dielectric layer.

6. The method of claim 5, wherein the substrate is selected from the group consisting of a single crystal silicon substrate, a silicon-on-insulator substrate, and a sapphire substrate.

7. The method of claim 5, further comprising patterning the vanadium

dioxide thin film to have an area of several μm^2.

8. The method of claim 7, wherein the patterning is performed using a photolithography process and a radio frequency-ion milling process.

5

9. The method of claim 5, wherein the source electrode, the drain electrode, and the gate electrode are formed using a lift-off process.